Glenn T. Seaborg Center Seminar

Probing Disorder in Pu(Am) through Magnetic Measurements

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An interesting feature of the actinide elements is the itinerant to localized transition of the 5f electrons that occurs between plutonium and americium. Experimentally, pure Pu shows neither magnetic ordering, nor the presence of local moments but does possess a large Pauli susceptibility; while pure Am is $5f^6$, thus possessing a J=0 ground state. At and below room temperature, Pu(Am) forms a stable fcc phase (δ-Pu, β-Am) from 6-80% Am, thus providing an opportunity to systematically examine this electronic transition as a function of Am concentration via magnetization measurements. This avenue of investigation explores the effect of expanding the Pu lattice by doping in oversized Am, which should tend to localize the 5f electrons of Pu, while the already localized 5f Am electrons should further remove electrons from the 5f conduction band. Pu and its alloys have been shown to be extremely sensitive to perturbations, particularly disorder. This is reflected by the observation that self-damage from the α-decay of Pu leads to the emergence of magnetic moments, which disappear when the damage is thermally annealed[1]. Results of radiation damage studies on the magnetic properties of Pu(Am) alloys provide an intriguing method to investigate the changing 5f electronic properties as a function of Am doping. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

[1]S.K. McCall, M.J. Fluss, B.W. Chung *et al* Proc Nat Acad Sci **103** 17179 (2006).

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